Precalc Warm Up # 4-3

Simplify:

1. $\dfrac{16x^3-54}{10x+15} \div \dfrac{4x^2-9}{4x}$

2. $\dfrac{4}{x^2-25} - \dfrac{x}{2x-10}$

3. Solve $3x^2 + x - 10 < 0$

4. Solve $|-2x + 4| > 10$

HW Questions: p. 129 PC book

16. $f(x) = \begin{cases} x^2+2 & ; x \le 1 \\ 2x^2+2 & ; x > 1 \end{cases}$

16a) $f(-2)$

16c)

17. $f(x) = x^2 - x + 1$

$$\frac{f(2+h) - f(2)}{h} =$$

$$\frac{(2+h)^2 - (2+h) + 1 - (2^2 - 2 + 1)}{h}$$

$$\frac{4 + 4h + h^2 - 2 - h + 1 - 3}{h}$$

$\dfrac{h^2 + 3h}{h}$ now factor out h ...

61. Express area, A, of a circle as a function of its circumference, C

$A(r) = \pi r^2$

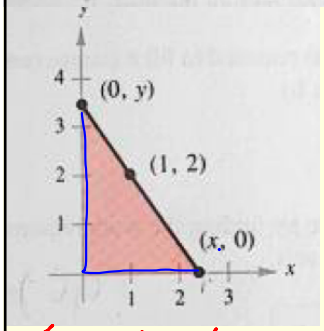
$A(C) = \pi\left(\frac{C}{2\pi}\right)^2$

$\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$

$A(C) = \frac{\pi}{1} \cdot \frac{C^2}{4\pi^2}$

$A(C) = \frac{C^2}{4\pi}$

65. A right triangle is formed in the first quadrant by the x- and y-axes and a line through the point (1, 2) (see figure). Write the area of the triangle as a function of x, and determine the domain of the function.



$A = \frac{1}{2}xy$

$A(x) = \frac{1}{2}x\left(\frac{2x}{x-1}\right)$

$A(x) = \frac{x^2}{x-1}$

dom: $x > 1$

$\left(\frac{y-2}{0-1}\right) = \left(\frac{2-0}{1-x}\right)(-1)$

$y - 2 = \frac{2(-1)}{(x-1)(-1)} + \frac{2(x-1)}{(x-1)}$

$+2 \quad +2$

$y = \frac{2+2x-2}{x-1}$

69. A company produces a product for which the variable cost is \$12.30 per unit and the fixed costs are \$98,000. The product sells for \$17.98. Let x be the number of units produced.

(a) Write the total cost C as a function of the number of units produced.

(b) Write the revenue R as a function of the number of units produced.

(c) Write the profit P as a function of the number of units produced. (*Note:* $P = R - C$.)

a) $C(x) = 12.3x + 98{,}000$

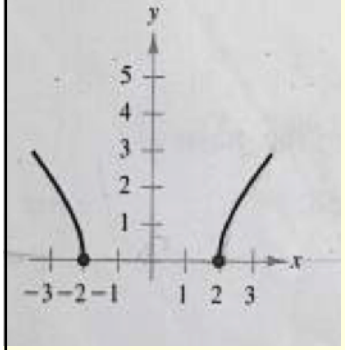
b) $R(x) = 17.98x$

c) $P(x)$

p. 142

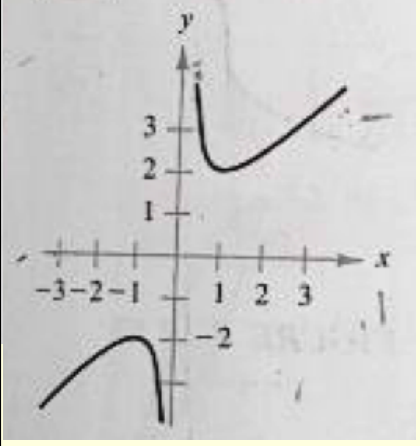
In Exercises 1–6, determine the domain and range of the given function.

3. $f(x) = \sqrt{x^2 - 4}$



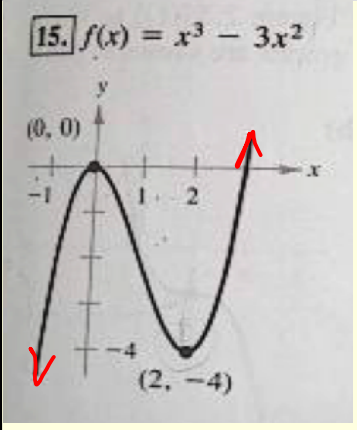
In Exercises 7–12, use the vertical line test to determine if y is a function of x.

11. $x^2 = xy - 1$

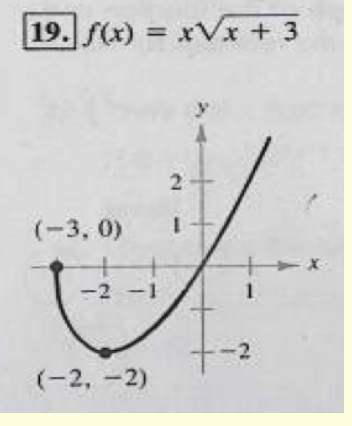


In Exercises 13–20, (a) determine the intervals over which the function is increasing, decreasing, or constant, and (b) determine if the function is even, odd, or neither.

15. $f(x) = x^3 - 3x^2$



19. $f(x) = x\sqrt{x + 3}$



inc: $(-\infty, 0) \cup (2, \infty)$

dec: $(0, 2)$

In Exercises 21–26, determine whether the given function is even, odd, or neither.

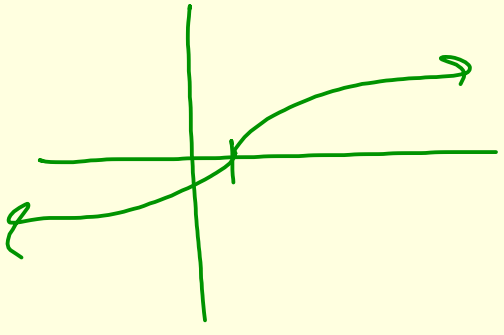
23. $g(x) = x^3 - 5x$

Graph. Odd, even or neither?

27.

31.

35. $g(t) = \sqrt[3]{t-1}$



37. $f(x) = \begin{cases} x+3, & x \le 0 \\ 3, & 0 < x \le 2 \\ 2x-1, & x > 2 \end{cases}$

Graph. Where is $f(x) \geq 0$?

41. $f(x) = x^2 - 9$

45. $f(x) = x^2 + 1$

Types of Relations (p. 109)

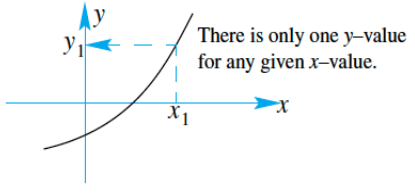
One to One:

5.1.4 TYPES OF RELATIONS

Relations fall into one of four categories. These are:

1. **One to one relations [one x to one y]**

   For any one value of x, there will be only one corresponding value of y.



DOMAIN and RANGE

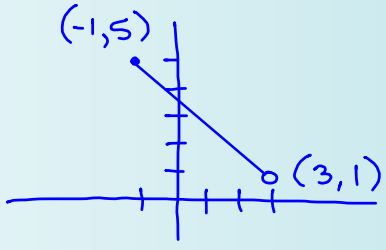
Determine the domain and range of the following relations

1. $y = x^2 + 3$, $x \in \{-3, 1, 7\}$ (domain)

$y = (-3)^2 + 3$
$= 12$
$y = 1^2 + 3$
$= 4$

$y \in \{12, 4, 52\}$ range

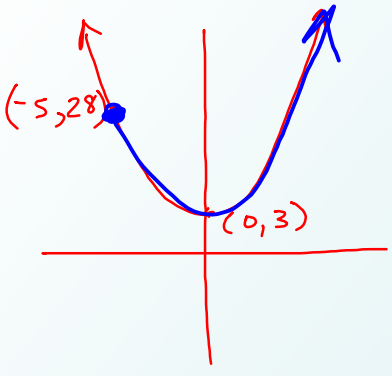
2. $y = 4 - x$, $-1 \le x < 3$ (domain)



range: $1 < y \le 5$

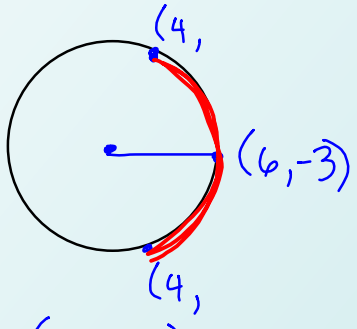
$(1, 5]$

3. $y = x^2 + 3$, $x \in [-5, \infty)$



range
$y \ge 3$
$[3, \infty)$

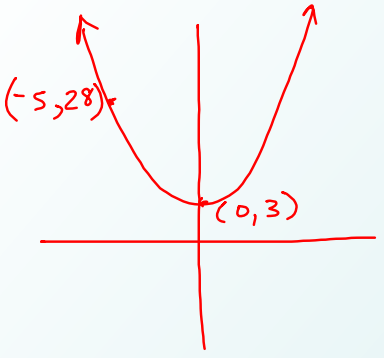
4. $(x - 2)^2 + (y + 3)^2 = 16$, $4 \le x \le 6$



$(2, -3)$

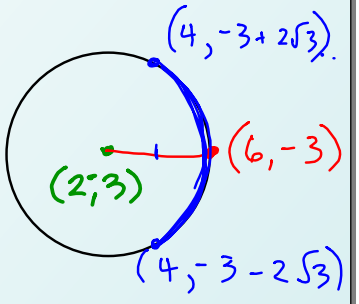
$(4-2)^2 + (y+3)^2 = 16$

3. $y = x^2 + 3$, $x \in [-5, \infty)$



4. $(x-2)^2 + (y+3)^2 = 16$,

$4 \le x \le 6$



$(4-2)^2 + (y+3)^2 = 16$

$\sqrt{(y+3)^2} = \sqrt{12}$

$y + 3 = \pm 2\sqrt{3}$

$y = -3 \pm 2\sqrt{3}$

range

$-3 - 2\sqrt{3} \le y \le -3 + 2\sqrt{3}$

5. $y = a^2x - ax^2$, $x \ge \frac{1}{2}a$, $a < 0$ → a is a negative #

dom: $x \ge \frac{a}{2}$

Just a parabola!

Standard Form: $y = -ax^2 + a^2x$

Lead coeff: $-a$ which is a positive # → opens up

Find the range by finding the vertex first:

$x = \frac{-a^2}{2(-a)} = \frac{-a^2}{-2a}$

$= \frac{a}{2}$

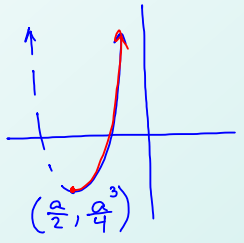
$y = -a\left(\frac{a}{2}\right)^2 + a^2\left(\frac{a}{2}\right)$

$y = -\frac{a^3}{4} + \frac{a^3}{2} \cdot \frac{2}{2}$

$y = \frac{a^3}{4}$

Vertex: $\left(\frac{a}{2}, \frac{a^3}{4}\right)$

Both x & y are negative!



dom: $x \ge \frac{a}{2}$

range: $y \ge \frac{a^3}{4}$

Implied Domain

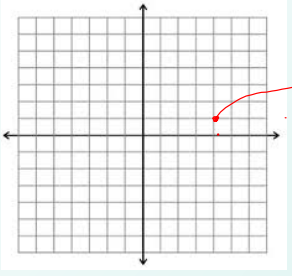
Give the Domain and Range of the following relations

1. $y = \sqrt{x-4}+1$

$x - 4 \geq 0$

dom: $x \geq 4$

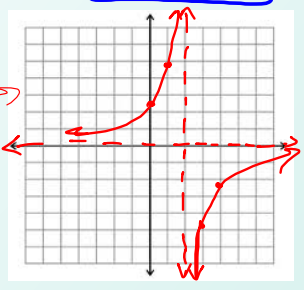
range: $y \geq 1$



2. $y = \dfrac{5}{2-x}$ $x \neq 2$, $\neq 0$

dom: $(-\infty, 2) \cup (2, \infty)$

$x \neq 2$



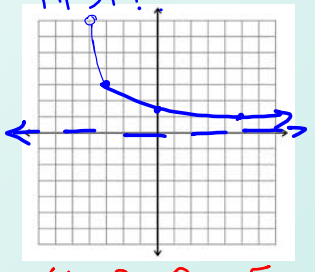
x	0	1	3	4
y	$\frac{5}{2}$	5	-5	$-\frac{5}{2}$

3. $y = \dfrac{3}{\sqrt{x+4}}$

dom: $x + 4 > 0$

$x > -4$

range: Graph it first!!



x	-3	0	5
y	3	$\frac{3}{2}$	1

4. Find the domain $axy + y - x = a$, $a > 0$

hint: solve for y

$$\frac{y(ax+1)}{ax+1} = \frac{a+x}{ax+1}$$

$ax + 1 \neq 0$

$ax \neq -1$

$x \neq -\frac{1}{a}$

HW: SL book p. 113

#1a, 2 LC, 3, 5 LC, 6 LC

(for 5j assume $a \geq 0$)